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Cultivation Breaks Down Tilth

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Cultivation BREAKS DOWN Tilth

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CULTIVATION CHANGES the surface soil. Yes, it loosens up the soil—but only temporarily. Actually, cultivation packs the soil tighter. That cuts down the large air spaces in your soil and makes it harder for water to penetrate into it.

Eventually, this means lower yields from even the most fertile soils. Your soil can't hold water that can't get in.

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But there's a way to get around that. A good rotation of grasses and legumes and proper use of lime, manure and fertilizers can help restore your soil to its most profitable condition. In addition, such a program will help control erosion.

Too Heavy Cropping . . .

Probably the most destructive effect of continued cultivation is that it breaks down the original aggregates or "crumb-like" characteristics of your soil. Smaller soil particles are closer together and leave less big air spaces in the soil.

These spaces are normally full of air. But, when rain falls, it's these same spaces into which the water penetrates. And, if those air spaces aren't present the soil can't take in as much water as it might. The soil's ability to hold the water isn't lessened. It's simply that the water intake is slower. It may run off on sloping ground or puddle on level ground.

Here's an example: Suppose your soil is capable of soaking up a full inch of rain in 1 hour. Well, if half an inch of rain falls within an hour, your soil can absorb all of it.

. . . Breaks Down "Tilth"

But suppose that years of cropping have cut down the size of these air spaces and packed the topsoil tighter—so the soil can soak up only a quarter of an inch

of rain per hour. Then, if half an inch of rain falls in an hour, your soil can't possibly take in more than that quarter inch of it. The other quarter inch is going to run off. And it may take part of your soil along with it.

That's the heart of the problem. Your crops suffer because they can't take advantage of the water that couldn't get into the soil.

There are many types of soils. And each is probably affected differently by the amount of "packing" caused by extended cultivation. Still, the general effect is the same—and you do have to cultivate your crops.

. . . Retards Water Intake

We studied six types of soils in central, southern and southwestern Iowa in our laboratories. We compared virgin soils with equivalent soils that had been cropped up to 50 years. In each of the soil types, years of cultivation had increased the density or weight of the topsoil and lessened its ability to take in available water. Each type was affected differently.

Minden soil that had been cropped for some time could take in water only 10 percent as fast as the same type of soil in its virgin condition.

In Edina soil, the difference was greater yet. After extended cultivation, Edina soil could absorb water only 3 percent as fast as the same type of soil in its virgin condition.

Similar differences occurred in each of the soil types tested. The table shows the differences in the rate of water intake for each of the six types of soils—both virgin and cultivated.

The table also shows how the density or weight per cubic foot of the topsoil was increased by cultivation. And, right along with that, the table shows how the air space or "porosity" was reduced in each soil type by the effects of cultivation. Weights of the topsoils were increased an average of about 20 percent by cultivation. That means your plow must lift that additional weight when plowing.

It's In Your Power

Since all these effects are confined to the plant feeding zone—particularly the first 12 inches—it's within your power to control them to some extent.

Work out a good rotation program including legumes and grasses. They improve the soil structure and increase its ability to take in available water.

Liming helps, too. It promotes better growth of the grasses and legumes to establish an even more improved and stable soil structure or tilth.

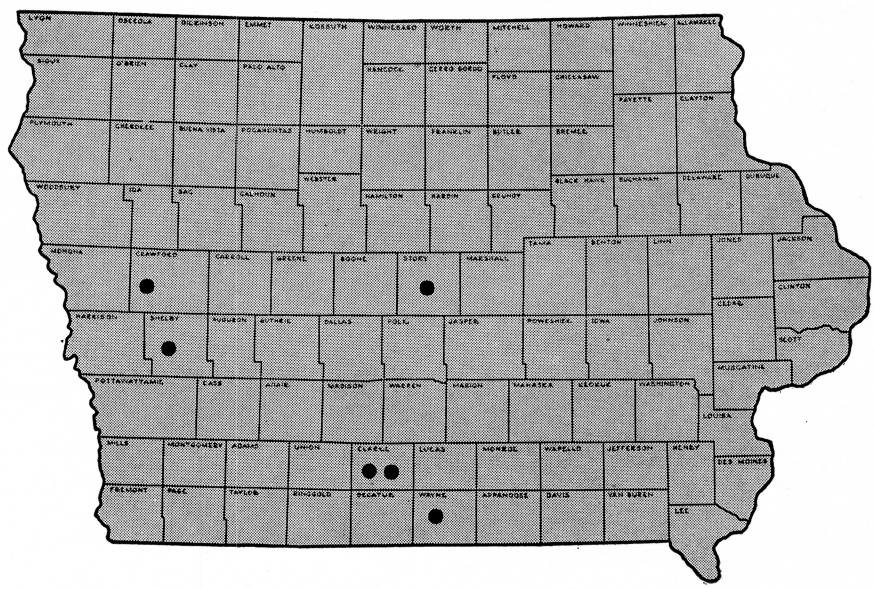
Spreading manure regularly can help—especially if it is used on crops like corn and soybeans which are plowed and cultivated often.

Good soil structure will pay off in the form of higher yields, less erosion and a more productive and efficient agriculture.

We'll give our crops a good start in life if we build or hold better surface soil structure.

Comparison of Virgin and Cultivated Surface Soils for 6 Iowa Soil Profiles

	SOIL TYPE					
Condition	Minden	Haig	Edina	Webster	Ida	Grundy
	Amounts of water taken in per hour by cultivated soils as percentages of that taken in by virgin soil.					
Cultivated	10%	4%	3%	——	6%	3%
	Volume Weight (lbs. per cu. ft.)					
Virgin	60	64	72	57	74	64
Cultivated	74	77	79	71	85	75
	Percent of Air Space					
Virgin	15	18	16	19	8	7
Cultivated	11	10	5	8	4	5



This map shows where soils samples were taken.